

A REPORT ON A COLLECTION OF ODONATA FROM NORTH SULAWESI, INDONESIA

by

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ABSTRACT

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Odonata collected in the first quarter of 1985 by two participants in Project Wallace, the Royal Entomological Society of London Expedition to Dumoga-Bone in North Sulawesi, are listed with observations, and distribution of the species is discussed. The dragonfly fauna is principally Oriental in affinities, but primary habitats harbour a high incidence of endemic taxa.

Key words. — Odonata; Sulawesi; Indonesia; Distribution.

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INTRODUCTION

As a prelude to his description of *Celebophlebia*, Lieftinck (1936) drew attention to the fact that up to that time no general account of the Odonata of Celebes (now Sulawesi) had been attempted. Although he clearly stated that his intention was to produce such a work, this task remained incomplete at his death in 1985. An opportunity to investigate the little-known odonate fauna of the north-eastern peninsula of Sulawesi (Sulawesi Utara) was afforded by Project Wallace, the Royal Entomological Society of London — Indonesian Institute of Sciences expedition in 1985. Two of us (Askew, Harman) participated in Project Wallace in the early months of 1985 and the material collected has been examined by Cleland and Davies and is reported upon here. Further recent collections, Lieftinck's detailed notes and the bulk of the historical material from Sulawesi are at Leiden Museum where they are being worked on by Dr Jan van Tol (1987a, 1987b). Additional relevant material is in the Hope Collections (Oxford) and the British Museum of Natural History (London) and this, together with descriptions of new taxa collected on Project Wallace, will be dealt with in future publications.

The expedition's base camp was situated in the Dumoga-Bone National Park at $0^{\circ}33'52''\text{N}$,

$123^{\circ}54'21''\text{E}$, some 200 m south of the River (Sungei) Toraut. Most observations were made within 2 km of base camp, a lowland area (alt. c 200 m) that included a good diversity of dragonfly biotopes in both the lowland primary rainforest to the north of the Toraut and in the land cleared for agricultural purposes to the south. Records from Sulawesi Utara from the region of Menado, Labuanagi (a village on the north coast), Danau Moot east of Kotamobagu and Kolintang about 6 km north of Malibagu on the south coast are also included, as are a few from the islands of Sangir Besar (Sangihe) (visited by Askew) and Ternate and Bacan (Batjan) (visited by Harman), and from Maros in south west Sulawesi north of Makassar (material in Davies' collection). Figure 1 illustrates the location of collecting sites.

ANNOTATED LIST OF SPECIES

Taxa from the Toraut base camp area are numbered. Details of the three pond sites in this area are as follows:

Riverine ponds. — Temporary rain pools at the edge of the forest on the north bank of S. Toraut.

Base camp pond. — A small, clean pond of recent formation about 5 square metres in area and 40 cm maximum depth almost surrounded by

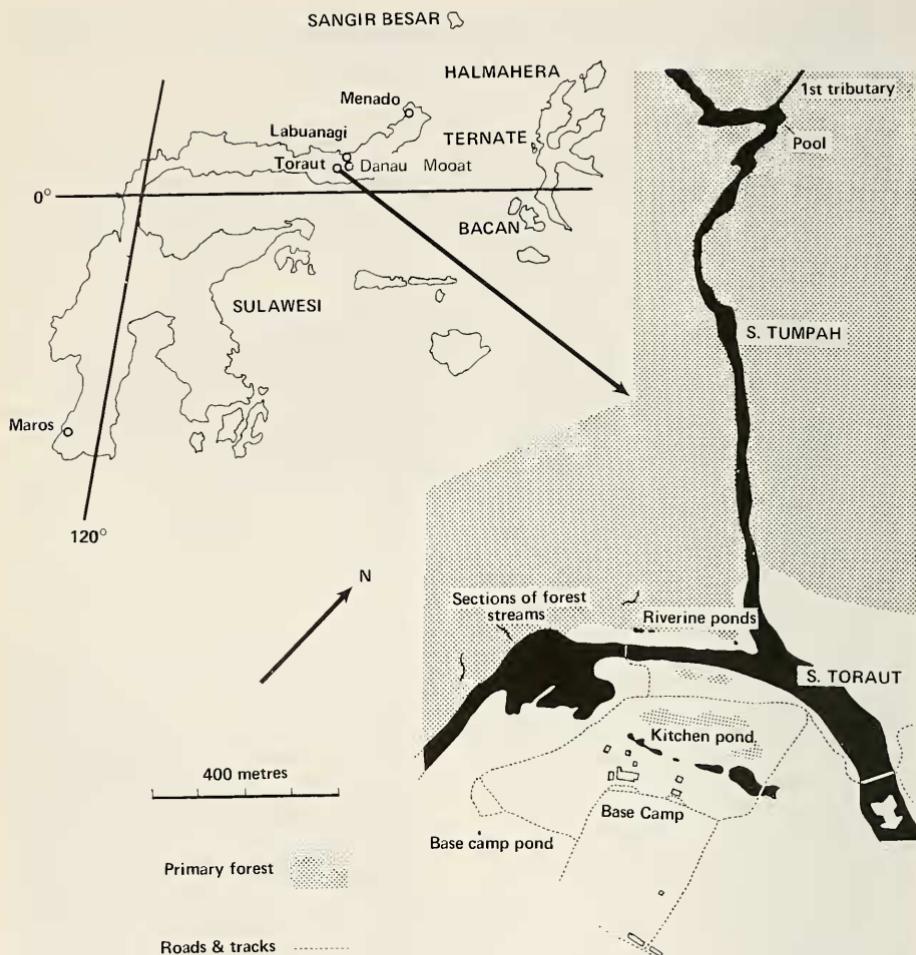


Fig. 1. The principal collecting sites in Sulawesi and Halmahera, and a sketch of the Project Wallace base camp area on Sungai Toraut.

brushy secondary vegetation but with few aquatic or emergent plants.

Kitchen pond. — One of a series of pools in a linear, marshy depression with a slow through-flow. Somewhat polluted by domestic effluent but supported fish.

CALOPTERYGIDAE

Neurobasis kaupi *kaupi* Brauer (1)

Toraut, S. Tumpah and first tributary. Regularly observed through February and March on this fast-flowing river, a major tributary of S. Toraut. Males

make frequent sorties from their perches on rocks in the river, their blue hindwings very conspicuous. Only occasionally rest on vegetation. Females less often seen, usually flying close to water margins. Mostly observed where flow-rate of river reduced.

CHLOROCYPHIDAE

Libellago rufescens (Selys) subsp. nov. (2)

Toraut, S. Tumpah and first tributary. Males seen frequently in February and March, perched upon rocks in fast-flowing sections of the river. Made brief sorties from perch to return after a few seconds. Difficult to follow in flight against ripples. No females noted.

L.r. rufescens (Selys)

S.W. Sulawesi, Maros. Two males, one female of the nominotypical form, collected 18.ix-9.x.1983, in Davies' collection.

L. xanthociana (Selys) (3)

Toraut. Observed from 17.ii.1985 through March only at one place on S. Toraut where males perched on rocks and jammed logs in the centre of the broad river. Seventeen counted in an area of about 4 square metres. No intersexual behaviour observed but males display to one another, a flying male hovering in front of and facing a perched male; latter spreads wings and raises abdomen. Only a few females seen, usually near the banks.

Rhinocypha monochroa Selys

S.W. Sulawesi, Maros. A pair in Davies' collection, 18.ix - 9.x.1983.

R. frontalis Selys (4)

Toraut, small forest streams feeding S. Toraut and S. Tumpah. Scarcest of the three Toraut chlorocyphids and noted only on small streams where males perched on bankside vegetation. Females not seen.

R. tincta semitincta (Selys)

Bacan, Fort Bentang and Air Blanda. Three males, one female, 7,8.iii.1985.

LESTIDAE

Lestes (Paralestes) praemorsus (Selys) (5)

Toraut, riverine pond. One male, 25.ii.1985.

COENAGRIONIDAE

Agriocnemis femina femina (Brauer) (6)

Toraut, Labuanagi, Bacan (also Java, Bogor). Common at base camp pond from January to end March and also a few on kitchen pond. In neglected rice paddy at Labuanagi. Polymorphic with male abdomen dorsally all black or with orange-red colouration on segments 8-10 and posterior third of 7 (numbers of captured specimens 7:4 respectively).

One example of an intermediate male form with only segments 9+10 red also taken. Immature females had abdominal segments 1-6 lemon yellow, 7-10 black, whilst mature females had 1-6 bluish, 7 reddish and 8-10 ochreous blackish.

Argiocnemis rubescens Selys (7)

Toraut, base camp pond, two males in February and one female in January. A second female taken in the forest in March.

Ischnura senegalensis Rambur (8)

Toraut, kitchen pond (also Java, Bogor). Only two of each sex taken.

Pseudagrion crocops Selys (9)

Toraut, Menado. At Toraut two of each sex were collected at kitchen pond, base camp pond and in the forest.

P. celebense Lieftinck (10)

Toraut, kitchen pond, single males on 26.ii and 6.iii.1985. A female at Menado, 7.ii.1985.

P. ustum Selys (11)

Toraut, one male at base camp 14.i.1985.

Ceriagrion sp. nov. 1

Danau Mooat, one male 25.iii.1985.

Ceriagrion sp. nov. 2

Bacan, Fort Bentang, a pair 8.iii.1985.

Teinobasis superba (Selys) (12)

Toraut, Ternate, Bacan. This species, with elongated abdomen, was frequently seen flying, sometimes in tandem, in the lowland forest at Toraut. It was usually in the vicinity of small forest streams but often flew up to the canopy. Very variable in size, two males from Toraut being very small but otherwise resembling closely the rest of our material.

T. helvola Lieftinck

One female in a coconut plantation near Dolo-

duo, about 8 km S.E. of base camp, 1.iii.1985. One male, Bacan, Fort Bentang, 8.iii.1985.

ISOSTICTIDAE

Selysioneura sp. nov.?

Sulawesi Utara, Koluntang, one female 29.i.1985. Attributed to this genus with some uncertainty. Most representatives of the family are confined to Australia, New Guinea or small islands off the N.E. Australian coast, but *Selysioneura* is known previously from Halmahera.

PROTONEURIDAE

Nososticta flavipennis (Selys) (13)

Toraut. Two pairs taken in tandem flying in the forest close to S. Toraut, 10.i. and 21.ii.1985. The female of the latter pair was ovipositing in a pool connected with a deep, still section of the river.

Nososticta sp. nov. 1 (14)

Toraut, forest edge. Two males, 20.i.1985.

Nososticta sp. nov. 2 (15)

Toraut, S. Tumpah, one male, i.1985.

PLATYSTICTIDAE

Identification of the following three species pends publication of a revision of Sulawesi Platystictidae by Dr J. van Tol.

Drepanosticta sp. 1 (16)

Toraut, forested W. bank of S. Tumpah, one female 9.iii.1985. Probably conspecific with a male and female taken at Kolintang (19.i. and ii.1985 respectively).

Drepanosticta sp. 2 (17)

Toraut, forest edge, one female, 8.i.1985.

Protosticta sp.

S. Tumpah, altitude 900 m. Two teneral males, 20.iii.1985.

AESHNIDAE

Anaciaeschna jaspidea (Burmeister)

Doloduo, 8 km S.E. of base camp. One male at light, 22.00 h, 20.ii.1985.

Heliaeschna filostyla Martin (18)

S. Tumpah. One male flying slowly downstream near confluence with first tributary, 15.iii.1985. Shortly before his death, M. Lieftinck, in a personal

communication to one of us (Davies), suggested that *H. filostyla* should be placed in a new genus. This possibility will be dealt with in a future publication.

Gynacantha basiguttata Selys

Bacan, Air Blanda, one female, 7.iii.1985.

G. bayadera Selys (19)

Toraut. Forest near S. Tumpah, two females, 12.i.1985 and (at rest beneath palm frond) 27.ii.1985. A large, dark dragonfly, seen several times flying low and fast through the forest and always evading capture, may have been the male of this species.

G. penelope Ris

Bacan, Air Blanda and Fort Bentang, one male and two females, 7,8.iii.1985.

G. rosenbergi Brauer (20)

S. Tumpah, one male, i.1985.

An anactine species was seen flying out of reach near the base camp pond on three occasions.

CORDULIIDAE

Hemicordulia assimilis Hagen in Selys

Bacan, Air Blanda. One female, 7.iii.1985.

Macromia irina Lieftinck (21)

S. Tumpah. Two males captured in March, one at altitude 900 m and the other near confluence with first tributary at low altitude (c. 280 m). Three or four observed at latter site, hawking about 2 m above a deep pool in the river but very evasive.

LIBELLULIDAE

Tetrathemis irregularis leptoptera (Selys) (22)

Toraut. Four males caught 21.ii.1985 at pool formed by inlet of river at forest edge, and others seen subsequently at this place. One male by S. Tumpah, 10.i.1985.

Nannophya pygmaea Rambur (23)

Toraut, Danau Mooat, Labuanagi, Menado. At Toraut observed only amongst marginal vegetation of kitchen pond.

Cratilla lineata (Brauer) (24)

Toraut, base camp. One male, 7.i.1985.

***Lyriothemis cleis* Brauer (25)**

Toraut, base camp. One male, 24.i.1985. Larvae of this species develop in water-filled rot-holes and a number were found in the forest adjacent to the base camp (Kitching 1986).

***Lathrecista asiatica* (Fabricius) (26)**

Toraut, base camp. A female (15.ii) and a male (5.iii.1985) taken.

***Agrionoptera insignis quatuornotata* Brauer (27)**

Toraut. Two males at pools in partly dried-up forest stream, 18.ii and 2.iii.1985.

***Nesoxenia mysis* (Selys) subsp. nov.**

Bacan, on coast 15 miles N.W. of Labula, one female, 4.iii.1985.

***Diplacina militaris* Ris (28)**

Toraut, Sangir. Only males found at Toraut, by S. Tumpah and small forest streams.

***Diplacina* sp. nov. 1 (29)**

Toraut. Two males and a female captured flying along the course of a small forest stream, 26.ii and 2.iii.1985. Another female observed ovipositing unaccompanied. One male by S. Tumpah.

***Diplacina* sp. nov. 2 (30)**

Toraut, base camp area. One male, 20.i.1985.

***Diplacina sanguinolenta* van Tol (31)**

Toraut. One male in forest north of river, 12.iii.1985. A distinctive *Diplacina* with abdominal segments 2, 3 and most of 4 blood red, the rest black. Recently described (van Tol 1987b) from material accumulated by Lieftinck from a range of localities in Sulawesi and Banggai Island.

***Potamarcha* congenere (Rambur) (32)**

Toraut. Common about base camp area, at riverine ponds and base camp pond.

***Orthetrum glaucum* (Brauer) (33)**

Toraut, Menado (Mt. Lokon). At Toraut one male taken at riverine pond and a female on S. Tumpah.

***O. chrysia* Selys (34)**

Toraut. Males taken in February and March mostly on the banks of S. Toraut but occasionally penetrating a short distance into the forest. One found devouring a large cyclorrhaphous fly.

***O. sabina* (Drury) (35)**

Toraut, Labuanagi, Danau Mooat, Menado (also Java, Bogor). Common at Toraut hawking amongst low vegetation on banks of S. Toraut, at mouth of S. Tumpah and at the very edge of the forest.

***Diplacodes trivialis* (Rambur) (36)**

Toraut, Labuanagi, Danau Mooat, Menado. The most abundant anisopteran at Toraut, hawking low over the ground on the base camp area and especially along paths. A female was observed ovipositing unaccompanied in base camp pond.

***Crocothemis servilia* (Drury) (37)**

Toraut. A single female in field of maize, 11.ii.1985.

***Neurothemis stigmatizans manadensis* (Boisduval) (38)**

Toraut, Labuanagi, Danau Mooat, Menado, Sangir. This conspicuous red-winged insect was common but with a very aggregated distribution in rank secondary vegetation near standing water. Males spent much time perching on vegetation, often only 1-2 m apart. Abundant in rice paddies at Labuanagi.

***N. fluctuans* (Fabricius) (39)**

Toraut. Much scarcer than its congener above and represented in our collections by just one of each sex taken on the base camp area in March.

***Neurothemis* sp. nov. (40)**

Toraut, Bacan. Allied to the above. Four females captured, two on the base camp area, one by S. Tumpah and one on Bacan (Fort Bentang), in January, February and March.

***Trithemis festiva* (Rambur) (41)**

Toraut. A female (22.ii.1985) and a male (6.iii.1985) taken beside S. Toraut.

***Zyxomma obtusum* Albarda (42)**

Toraut. Quite plentiful at kitchen pond and one seen at riverine pond at forest edge, but difficult to catch (only one male taken). It appeared about 18.00 h at kitchen pond where males established territories along lengths (about 10 m) of pond margin which they patrolled by flying back and forth just a few centimetres above the water surface. Their white colouration rendered them conspicuous in the fading light.

***Tholymis tillarga* (Fabricius) (43)**

Toraut, Menado. Males common on kitchen

pond and one observed hovering 50 cm above an ovipositing female. A female came to an electric light at 21.00 h and another was found just in the forest resting beneath a palm frond.

Tramea eurybia (Selys)

Ternate. Two males captured 2.iii.1985 at edge of volcano crater at 1700 m altitude.

T. transmarina (Brauer) subsp. nov. (44)

Toraut. Single male, 27.i.1985, flying in sunshine at base camp. Several specimens of a *Tramea* species were seen flying above the road at Danau Mooat.

Pantala flavescens (Fabricius) (45)

Toraut, Menado. Very common about base camp, hawking in numbers at 2-4 m above the ground. A male came to electric light about 22.00 h.

Celebothemis delecollei Ris (46)

Toraut. Both sexes found throughout March at the pool in S. Tumpah by its confluence with first tributary. Not observed elsewhere.

GEOGRAPHICAL RANGES AND HABITATS OF THE TORAUT TAXA

Of the 46 taxa collected within about 2 km of the Project Wallace base camp on S. Toraut, ten are apparently undescribed, twelve are so far known

Table 2. The distribution by habitats of taxa known only from Sulawesi and of those with a broader distribution.

	Primary habitats	Secondary habitats	Both
Endemic & undescribed taxa	16	4	2
More widespread taxa	3	15	6

only from Sulawesi, 16 are found in the Oriental region (in some cases in other zoogeographical regions as well but not in the Australasian region) and eight have ranges that include both the Oriental and Australasian regions. Ranges of the taxa by families are shown in table 1. Most of the Zygoptera (11 of 17) are so far known only from Sulawesi, but the majority of Anisoptera (18 of 29) have considerably broader ranges. The level of endemism in Sulawesi Odonata is high, but the fauna includes many Libellulidae, the dominant family, with a broad distribution in south-east Asia. There are few indications of Australasian elements in the odonate fauna. Only the single species of Isostictidae, which was not found at Toraut, has a probable Australasian derivation. The dragonfly fauna of Sulawesi is therefore predominantly Oriental, a conclusion reached also by van Tol (1987a), but knowledge of dragonfly distribution is insufficiently complete to allow us to indicate narrower geographical affinities. The existence of a small Australian component is not at variance with the suggestion that Sulawesi is a conglomerate of part of an island arc of Oriental origin forming Sangir, the northern peninsula (Sulawesi Utara) and western Sulawesi, and a mass including the eastern and south-eastern peninsulas originating in the Australasian region.

Habitats of the Toraut fauna may be classified as primary (those in the rainforest and major rivers) or secondary (those in clearly man-modified situations). The distribution of taxa between these two habitat classes (table 2) shows that the endemic taxa predominate in primary habitats whilst species having a broad geographical range occur principally in secondary habitats. Whilst this is what would be expected, the data are influenced by the absence of permanent ponds, suitable for colonisation by the more widespread Libellulidae, from the forest area surveyed. Van Tol (1987a) similarly found the Odonata of primary forest streams to be nearly all endemic to Sulawesi. He lists (van Tol 1987a, 1987b) the following additional species from Dumoga-Bone: *Celebargiolestes cinctus* (Se-

Table 1. Geographical distribution of species and subspecies by families in the Toraut fauna.

	Sulawesi only (+ undescri. taxa)	Oriental	Oriental + Australasian	Total taxa
Zygoptera				
Calopterygidae	1	0	0	1
Chlorocyphidae	2(1)	0	0	3
Lestidae	0	1	0	1
Coenagrionidae	2	3	2	7
Protoneuriidae	1(2)	0	0	3
Platystictidae	(2)	0	0	2
Anisoptera				
Aeshnidae	1	1	1	3
Corduliidae	1	0	0	1
Libellulidae	4(5)	11	5	25
Totals	12(10)	16	8	46

lys) (*Megapodagrionidae*), ?*Paragomphus capitatus* (Martin) (*Gomphidae*) — found as larva only, *Nannophlebia aglaia* Lieftinck (*Libellulidae*) and *Diplacina torrenticola* van Tol which are all endemic, plus *Orthetrum pruinatum* (Burmeister) (*Libellulidae*).

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